

Climate Change Already Having Impact On U.S., Expected To Worsen

ScienceDaily (June 17, 2009) — Extreme weather, drought, heavy rainfall and increasing temperatures are a fact of life in many parts of the US as a result of human-induced climate change, researchers report. These and other changes will continue and likely increase in intensity into the future, the scientists found. For the southwest region of the United States, which includes California, the report forecasts a hotter, drier climate with significant effects on the environment, agriculture and health.

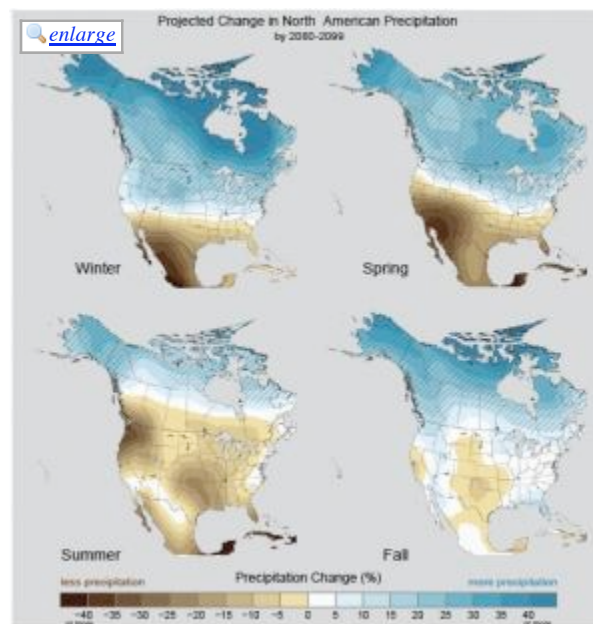
Researchers representing 13 U.S. government science agencies, major universities and research institutes produced the major report entitled "Global Climate Change Impacts in the United States." Two researchers at the U.S. Department of Energy's Lawrence Berkeley National Laboratory (Berkeley Lab), Evan Mills and Michael Wehner, contributed to the analysis in the study, released June 16 by the multi-agency U.S. Global Change Research Program.

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"Global Climate Change Impacts in the United States" covers such effects as changes in rainfall patterns, drought, wildfire, Atlantic hurricanes, and effects on food production, fish stocks and other wildlife, energy, agriculture, water supplies, and coastal communities.

"This is the most thorough and up-to-date review ever assembled of climate-change impacts observed to date as well as those anticipated in the future across the United States," says Evan Mills, one of the Berkeley Lab scientists who contributed to the report. While the report paints an ominous picture of potential impacts, "the good news is that the harshest impacts of future climate change can be avoided if the nation takes deliberate action soon. This can be done through a balanced mix of activities to reduce greenhouse-gas emissions and adaptation to the otherwise unavoidable impacts," says Mills.

The report addresses nine zones of the United States (Southwest, Northwest, Great Plains, Midwest, Southeast, Northeast, Alaska, U.S. islands, and coasts), and describes potential climate change effects in each. California is part of the southwest zone, as well as a coastal zone.



Precipitation map developed by Berkeley Lab's Michael Wehner shows, among other things, a substantial reduction in springtime rains in California, and summertime rains in the Pacific Northwest. (Credit: Image courtesy of DOE/Lawrence Berkeley National Laboratory)

Wehner, who is a climate researcher in the Scientific Computing Group of Berkeley Lab's Computational Research Division, developed projections of future climate change for the report chapters covering global and national impacts of climate change. One of Wehner's research interests is extreme weather conditions resulting from climate change.

The precipitation map shown is one of the projections developed by Wehner. It shows, among other things, a substantial reduction in springtime rains in California, and summertime rains in the Pacific Northwest.

"Even in areas where precipitation is projected to increase, higher temperatures will cause greater evaporation leading to a future where drought conditions are the normal state. In the southwest United States, water resource issues will become a major issue," says Wehner.

Another of Wehner's graphics shows past and future projections of the global mean surface air temperature, an indicator of the magnitude of the effects of global climate change. The three different trajectories after 2009 show low emissions, and two high emissions scenarios of how the temperature increase caused by greenhouse gas emissions could play out. The projections are based on the most sophisticated climate models available.

"These and similar projections reveal that actions taken today would take several decades to make any noticeable change in the rate of warming. This is one of the factors that makes climate change a difficult policy issue. There is no instant gratification," says Wehner.

Mills, who studies climate change and the insurance industry in the Environmental Energy Technologies Division of Berkeley Lab, worked on the report's sections addressing impacts on society and on the energy sector. The insurance industry has been one of the early responders to the threats posed by climate change, because the industry has been a leader in preventive education against catastrophes such as fire and windstorm hazards. Extreme weather conditions, and the resulting damage, will probably impact the industry's bottom line, possibly severely, as well as that of government provided insurance programs for floods and crops.

"Insurance is one of the industries particularly vulnerable to increasing extreme weather events such as severe storms, but it also is beginning to help society manage the risks," says Mills. "Insurance, the world's largest industry, will be one of the primary mechanisms through which the costs of climate change are distributed across society. Some insurers are emerging as partners in climate science and the formulation of public policy and adaptation strategies. Others have recognized that mitigation and adaptation can work hand in hand in a coordinated climate risk-management strategy and are offering "green" insurance products designed to capture these dual benefits."

A Drier California

Decline in precipitation and water supplies will likely be one of the most prominent effects of climate change in California and other states of the southwest (Nevada, Arizona, Utah, Colorado, and New Mexico). The report suggests that runoff will decline from 10 to 40 percent in 2040 to 2060 relative to the 1901-1970 baseline, and warns that scarce water supplies will call for trade-offs among competing uses.

"Floods and droughts are likely to become much more common and intense as regional and seasonal precipitation patterns change and rainfall is more concentrated into heavy events with longer dry periods in between," it states.

There will likely be less snow, with more winter precipitation falling as rain, and the wet areas will get wetter as dry areas get dryer. The region will likely see declines in the mountain snowpack, and runoff will shift to earlier in spring, reducing water flows later in the year in the summer. California is strongly dependent on spring and summer runoff to supply water for residential, commercial and agricultural

uses.

Agriculture in California will likely face increasing stress from the decline in runoff and drought, as well as increasing air temperatures, and the probable rise in agricultural pests and weeds expected in a warmer climate. Flooding and storm surges are threats to coastal regions.

Forest growth in the west will decrease because of the decreasing availability of water. This will also put additional stress on salmon, trout and other coldwater fish. Superinfestations of insects will cause ecological and economic damages to timberlands.

A Hotter California

Increasing air temperatures attributed to global warming are expected to cause a rise in the number of heat-related illnesses in the 2080 to 2099 timeframe. In parts of southern California, the state's southern Central Valley, and western Arizona, for instance, the number of days in which the temperature exceeds 100°F could exceed 120 under the report's higher emissions scenario.

Changes in the nation's population and distribution could combine to amplify the probability of increasing heat-related disease. As the nation ages, its older members move to warmer areas of the country including the desert southwest.

Another effect of these higher temperatures will be increased energy demand. The report predicts "increases in demand for cooling energy" in California as well as elsewhere, which will result in "significant increases in electricity use and higher peak demand in most regions." Mills contributed analysis to the report of the strongly rising role of extreme weather events in causing electric power disruptions, while non-weather-related events show no upward trend.

The full report, "Global Climate Change Impacts in the United States" is available at:
<http://www.globalchange.gov/usimpacts>

Adapted from materials provided by [DOE/Lawrence Berkeley National Laboratory](#).

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